

HOT IRON #133: May 31, 2026

THE JOURNAL OF THE CONSTRUCTOR'S CLUB

Technical Editor: Please send technical questions and suggestions [to Peter, G6NGR](#)

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Our wonderful hobby includes those with a great deal of electronic knowledge as well as those just beginning their journey. Some prefer digital modes and projects, others prefer analog projects and devices that glow in the dark. Our quarterly newsletter, begun by [G3PCJ of Walford Electronics](#), tries to publish something for each, while trying to keep the focus on construction of various devices!

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Miscellaneous News and items of interest:

* **Goodby to CHU.** Canada is shutting down CHU on June 22nd, stating that the government will continue to provide official time services through internet and telephone systems. We hope the internet and telephone systems never fail. Some suspect it is a cost-saving measure.

* For builders (constructors) and hobbyists, a large amount of reference information can be found on [the “Resources” page](#) of the website. Have a look to see if any of it relates to your current activities. Similarly, [the “Construction” page](#) might have information that is useful to you.

* [Digital Library of Amateur Radio & Communications:](#) If you haven't visited the [Internet Archive](#), now's a good time! It contains a huge [DLARC library](#) – There, you can find copies of almost all ham radio magazines, including QST, CQ and almost all editions of 73 magazine. *Hot Iron* is there too!

* [Ham Radio Weekly #410](#) continues its coverage of the revitalization of HamClock. There's lots more, including: What's Knot to Like? [PA3DJS provides a 257 page book \(.pdf\) that will tell you everything you might wish to know about ropes and knots, especially as applied to our hobby.](#)

* Did you know that the venerable [Signetics 555 programmable timer chip](#) is the world's best-selling integrated circuit? Designed in 1970 it lives on, mostly in microcontroller products; [here are just a few examples.](#) It just won't quit ticking!

- * Similarly, the Motorola transistors 2N2222 and 2N3904 made their debut in 1962 and were the first successful silicon-based devices. These PNP devices and NPN equivalents are still manufactured in high volumes today while other attempts have vanished.
- * [Chris' Musings in the recent AWA Newsletter](#) continues some thoughts about Vacuum Tube Vs. Solid State usage in transmitters. Quite an interesting bit of history.
- * Bob's Your Uncle? [Ham Radio Outside the Box \(VA3KOT\)](#) has an article about a Linear-Loaded hiking antenna that is less than nine feet (~3 meters) high. It's a vertical antenna and with its short length it would be easy to deploy.
- * [Random Wire Newsletter](#) has an article (issue 177) about Yaesu's WiRES-X 2.0 PC software. If you use this software, this major update is must-reading.
- * **ITU Corporation** has purchased the Hy-Gain and Cushcraft brands from MFJ and is moving the manufacturing operations to a new 15-acre facility in Linton, Indiana.
- * ["Arcanum is ORI's new open source CMoM antenna simulation engine"](#). It is, to the best of our knowledge, the first open source implementation of the Conformal Method of Moments with Exact Kernel. " I have no idea what this maths model means but, if you are involved in modeling antennas, you will know what it means and how it might replace, or augment, NEC-2. Click the link to read about it in Open Research Institute's article. This news was reported by *Amateur Radio Weekly*.
- * **The end of an era:** [Amateur Radio Weekly](#) reports: BBC Radio 4's Long Wave (LW) service (begun in the early 1930's) on 198kHz will close on 27 June 2026. This was announced by the BBC on 11 May. Although expected in 2026, this date is earlier than was anticipated. On the air, the BBC have been more specific with the time given as 0100 BST (0000 UTC) on 27 June 2026. The Long Wave transmitting stations: Droitwich in Worcestershire, Westerglen near Stirling in Scotland and Burghead overlooking the Moray Firth also in Scotland, will all be closed down that day. [Read all about it at this RSGB link \(possible paywall\).](#)
- * [Star Catcher](#) is developing a space-based energy infrastructure that delivers electricity on demand to spacecraft using optical power beaming. The company has raised a total of \$88 million in capital.
- * [Aetherflux](#) was issued WQ2XEW for its Reason-1 satellite. Its mission is to convert sunlight into electricity and transmit the power to a ground station on Earth.

PROJECTS & CONSTRUCTION SECTION:

* **For our projects we sometimes want a custom aluminum chassis.** About 40 years ago W4NPN made a drawing showing how to bend aluminum into a chassis having a top and sides, with the sides having a small final bend to form a footer along the side. [Here is a copy of that old document, recently excavated from the archives, that shows how to cut the aluminum blank, how to mark the bend lines and the sequence of the bends.](#) We hope it helps someone.

Remember that each bend will have a “Bend Radius.” This is the width of metal that will inhabit the bend and one must add this radius to the total length or width of the metal being bent, or the side will be short that amount, in its length or height. For example, when bending the common 1/16” (1.5875mm) 6061 aluminum sheet, a 1/8th inch (~3 mm) radius will usually do the job. [But go to this link to find a proper bending radius for nearly any situation.](#)

A helpful aspect of making a custom chassis is that it allows making the depth more than the usual 2 inches (about 50mm) deep. Sometimes in RF work, we want to put an input circuit below the chassis and the output circuit above it. This increased depth can help that. More information about making a chassis is found toward the bottom of [column 1 of this web page.](#)

If you are bending both a chassis and a cover for the chassis, and cutting a panel for the new device, it is suggested that the cover (the “box”) be made first. That way, you can cut a panel that will exactly fit the cover you have bent. This is because sometimes the dimension of the cover might be a few millimeters different from what was expected unless you are quite skilled at this. If this occurs, the panel might not fit properly, so make it the last thing you cut.

* [Nuts and Volts Magazine](#) has issued Part 8 of the *Bipolar Transistor Cookbook*. Parts 1 through 8 can be found at the sidebar contained on the linked website. Part 8 contains various circuits for simple-to-make devices such as a signal tracer, noise limiter, and variable Zener regulator. Example #9 provides a simple Hartley oscillator whose harmonics would make it a useful Signal Generator. Use your digital transceiver to calibrate the variable output frequencies, if such calibration is needed.

* **The WB4KDI “Upside Down” Low Voltage Power supply.** When building a low voltage (13 – 15 volt) linear power supply to power equipment, the pass transistors must frequently be insulated from the heat sink since they are in the positive lead. This complexity is avoided by putting them in the negative lead and bolting them directly to the heat sink, which can sometimes be the chassis or back panel of the supply itself. It greatly simplifies the construction of the supply and no additional cooling is usually needed. This is an old design that merits a repeat so here it is. W4NPN has been using one for over twenty years without a failure. The heavy bottom plate of the case is the heat sink. The article can be found in the middle column of links on the web page.

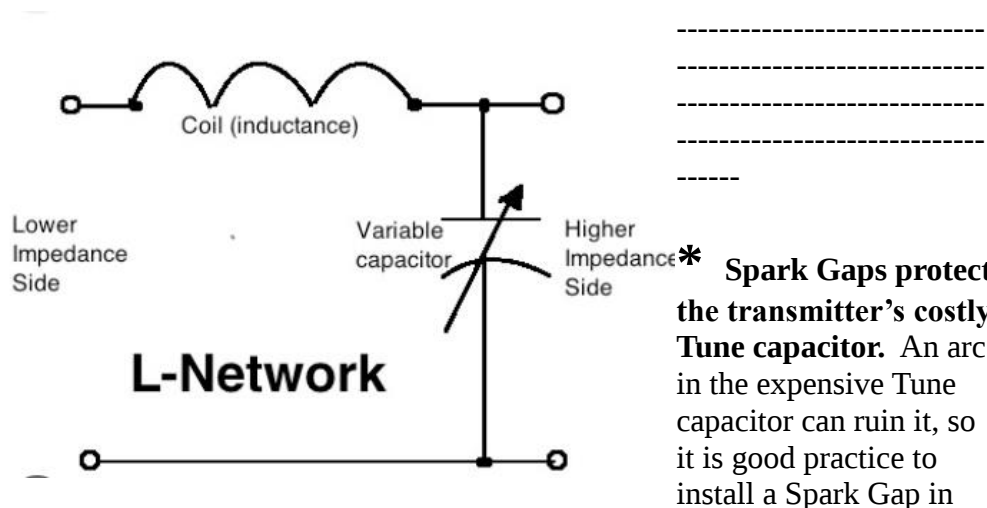
* **VA3KOT’s “Ham Radio Outside the Box”** website has an article about using an L-Match tuner with an EFHW antenna for several reasons. Quoting:

“Here is a project that provides a much more efficient way of matching an End-Fed Half Wave antenna than the usual 49:1 impedance transformer. High ratio transformers are prone to inductance leakage, core saturation and overheating leading to low efficiency. Although a 49:1 (or similar high ratio) transformer can present a low SWR to a transceiver, that is not a good indicator of the transformer’s efficiency. It only tells us our radio will not be damaged; it provides no useful information about how much of our signal will actually be radiated. Also, even though a low SWR can be obtained on multiple bands, the radiation pattern breaks up into multiple lobes and nulls on the higher harmonics. End-Fed Half-Wave antennas should really only be used on their fundamental frequency band and its second harmonic. “

* Much discussion of tuner types can be found on the internet, but perhaps the simplest is the L-Match used by VA3KOT in his article (above). The advantages of the L-Match include:

- It can match to either an antenna that is of high or of low Z by simply reversing the coax connections (or switching the capacitor’s connection).
- It is considered to be the most efficient (low loss) design.
- It presents a single match solution and this will always be the most efficient.
- Construction is extremely simple (see illustration below). If a variable inductor is available, it becomes even easier to use as no switch-selected connections to the inductor’s turns are needed.
- If the feedline is twinlead, insert a 1:1 balun between the feedline and the High Z side of the Matching network. See the drawing below. A switch can be used to move the capacitor from the hi-z to the low-z side, if desired. Simple, no?

[You can read more about tuner types and pro’s and con’s at this link.](#)
Here’s the simple L-match:



parallel to protect both it and the band switch. In a recent Drake-Group exchange, VE7RF reminds us how to create one. Paraphrasing:

Home brew spark gaps can be made from 6-32, 8-32, 10-32 or 1/4-20 hardware (or European metric equivalents). Be sure to use locknuts to lock the gap once it is set. Where the pair of machine screws face each other, install brass or stainless steel acorn nuts with their domed or semi-domed surfaces facing each other. Sometimes the chassis, an aluminum standoff, or angle aluminum, etc., can be used as one of the surfaces. Set the gap using a feeler gage or other insert and make sure the gap is slightly smaller than the gap between the plates of the Tune capacitor. This way, the spark gap will arc first and

protect the Tune capacitor, the Bandswitch, and in some cases, the power supply (your power supply does have a glitch resistor and high voltage fuse installed, right? Right?).

N0CU has more comments about this subject: “Arc suppressors are a great concept but the problem with them is knowing how to get the gap set properly. As Jim pointed out, the Ameritron factory had trouble doing this. Every one of their legal limit amps I have worked on had a damaged plate tuning cap due to arcing. One of these amps had the gap set at over 1/2 inch which made it useless. Setting the gap based upon theory is complicated by the fact that breakdown voltage is affected by the shape of the surfaces- sharp surfaces breakdown before flat surfaces. The best way to set the gap is with a current limited, variable high voltage source, however, very few hams have access to one of these. Whenever arcing is experienced an effort should be made to at least verify that the arcing is occurring across the suppressor and not the plate tuning capacitor.”

[Scroll down in Column 2 of this web page to read about this subject.](#)

* **Another Tank Circuit safety measure** is to install a properly-sized Gas Discharge Tube in parallel with the Load capacitor. But that’s a subject for another day. Of course, if you pose a carefully worded question to ChatGPT, it will tell you all about GDT’s and their sizing.

* [Crystal Clear, a .pdf book that provides the history of radio crystals](#) and how they were mass-produced during WWII. It is interesting reading. Find it at the bottom of column 3, on the linked page.

* Also at the bottom of column 3 on the linked page is a link to a website that contains extensive descriptions and measurements of the different crystal sizes and types. It’s a commercial firm but *Hot Iron* has no relationship with them – it’s just helpful information.

Nostalgia Department:

* **Command Set Audio Output Transformers:** N4LG has written an extensive document about audio output transformers used in “Command Sets” (SCR, ARC, BC, etc). It includes improvement recommendations! [Find a copy at the end of Column 2 of this link.](#)

Trouble-Shooting and Repair Section:

* **Broken Loudspeaker Field Coil?** If working on an old receiver that uses the loudspeaker field coil as the power supply filter choke, and if that coil is broken, what to do? Obviously the loudspeaker will need replacing and a stand-alone filter choke could be installed, but here’s an alternative to adding a new filter choke: [This link provides that alternative.](#)

* **Tube Testers (a.k.a. Tube Checkers).** Find an [excellent article at the bottom of Column 1 on this link](#), about the different models of Heathkit tube testers that were produced over the years.

* How many of us have had a need to find the source of an equipment malfunction and repair it? I suspect most of us have had to do that, especially with older equipment or during a restoration project. [A series of articles related to troubleshooting](#) are found on this page, and are repeated below. This is very much a work in progress so please let Frank know of any good articles you have found, at fbw4nnpn@gmail.com. I have been unable to find much info about troubleshooting digital circuits but I'll keep looking.

[A Universal Troubleshooting Guide](#)

[Troubleshooting Stage-by-Stage \(old tube radios\)](#)

[Riders Servicing Superheterodynes \(an old but still valid pub\)](#)

[Restoration of Valved Communications Receivers](#)

[The Duffer's Guide to Valve Set Fault-finding.](#)

[CHRS Hints and Kinks](#)

[ARRL Servicing Guide, Part 1](#)

[ARRL Servicing Guide, Part 2](#)

[ARRL Servicing Guide, Part 3](#)

[Trouble-shooting Analog Circuits](#)

[Here's some useful info.](#) on keeping low current switch contacts (typically found in amateur CW keys, etc.) clean and 100% operational. There are many other ways: a small (1 -10 nF capacitor across the contacts to provide a surge of mA's on closure for instance). A Google search will find plenty on this topic...!https://en.wikipedia.org/wiki/Wetting_current

* **Installing MOV's.** In some cases it might be desirable to install an MOV across the devices AC line. If so, remember that MOV's always create a short circuit when they fail. Therefore, be certain to install them AFTER the line fuse, so that the short circuit will blow the fuse and shut down the device.

* **Have a volt or MA meter** whose needle tends to slam back and forth violently under different operating conditions? The violent movements can usually be slowed by installing a 50 uf electrolytic capacitor across the meter terminals. Be sure its voltage rating is appropriate for the circuit involved. The capacitor should not materially affect the value displayed.

* Handy Electronic Calculator. [Here's a handy series of calculators often needed in radio work.](#)

Antenna Stuff:

* [Go here for an extensive collection of antenna articles and information, courtesy of AC6LA.](#)

- * [Go here for another collection of antenna articles and information, from W4NPN.](#)

Ham Radio Clubs and Organizations:

Knightlites QRP Association: This QRP club meets Sunday nights on or around 3571.5 Khz at 9 pm EST. The link provided here goes directly to their “Links” page where many other QRP clubs can be found. Go to the home page to read more about the club. Go also to [**KnightlitesQRP@groups.io**](mailto:KnightlitesQRP@groups.io) to see what’s being talked about!

Burnley & District Amateur Radio Club - MX0STB This club, in Lancashire, currently has 34 members and has recently acquired some surplus gear from another UK amateur.

Raleigh Amateur Radio Society, located in Raleigh, NC, USA, is one of the larger U.S. clubs and holds one of the nation’s largest “Hamfests” each Spring. It also holds licensing and training sessions and has a significant public service component.

GORP low-power club was formed in 1974 by Rev. George Dobbs G3RJV (SK). It is a non-profit organisation run entirely by volunteers to promote **Low Power Radio (QRP)**. Whether you have a ham license or not - everyone is welcome. The **SPRAT** quarterly magazine provides a fascinating read containing articles of varying complexity, from simple test equipment, to fully functioning radio transmitters and receivers. You can join the club from the website and have SPRAT mailed to you.

GORP also has a YouTube Channel at this link.

Four States QRP club has ideas and features focused on QRP operations and construction.

The Michigan QRP club has a simple DC Receiver kit which might still be available.

Surrey Amateur Radio Communications publishes a professional grade newsletter every two months. Put a link to it on your desktop!

(Let’s get your club listed here - send the information to Frank at fbw4nnp@gmail.com!)

Tidbits and Odds and Ends:

* William R. Hepburn runs the [**DX Info Centre Tropospheric Ducting Forecast**](#) website which provides six-day tropospheric ducting information and forecasting for those interested in exploring VHF, UHF and Microwave DX through the use of these ducting channels. These have the necessary atmospheric conditions to produce tropospheric bending of the waves, which extends the range of stations well beyond normal limits.

* [**AM Broadcast Coverage Night Patterns, for U.S. and Canadian MW stations**](#) (created by NF8M). Pick any MW frequency and see the typical coverage areas. A unique service!

* **Antenna Headings:** VU2NSB provides a handy tool to show compass bearings to “everywhere” once your Maidenhead grid square is entered. [Here is the link to that website and service.](#)

* **QRPpppp and WSPR allows you to check your antenna’s** multi-band transmitting and receiving performance. [This article by N2YCH discusses this using available software and common techniques.](#)

* **Searching for a Net?** [This website by K4HCK helps you to find one in the locality you choose.](#)

* [Andy’s \(KB1OIQ\) Ham Radio Linux Distribution](#) seeks to gather many ham apps compatible with Linux into one location. This video explains what he has done and continues to do.

[Go to this web page to see Hot Iron’s list of known Ham Clubs, Ham Radio Publications and YouTube Channels. Please let us know of additional ones!](#)

The W4NPN website hosts the library of Hot Iron issues and provides ham-related information. A list of website major categories is below:

[Hot Iron \(library of issues, register\)](#)

[RF Amplifiers](#)

[Antenna Information \(Antennas, SWR, Metering, etc\)](#)

[Baluns, Ununs, etc.](#)

[Construction Articles and Ideas](#)

[Power Supplies](#)

[Resources \(many!\)](#)

[Tuners](#)

[VFO’s \(a compendium of articles about tube and solid state designs\)](#)

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